МИНИСТЕРСТВО ВЫСШЕГО ОБРАЗОВАНИЯ, НАУКИ И ИННОВАЦИЙ РЕСПУБЛИКИ УЗБЕКИСТАН

ФЕРГАНСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ

ЮЖНО-КАЗАХСТАНСКИЙ УНИВЕРСИТЕТ ИМЕНИ М.АУЭЗОВА

ФЕРГАНСКИЙ МЕДИЦИНСКИЙ ИНСТИТУТ ОБЩЕСТВЕННОГО ЗДРАВОХРАНЕНИЕ

МАТЕРИАЛЫ

Международной научной конференции

“ТЕНДЕНЦИИ РАЗВИТИЯ ФИЗИКИ КОНДЕНСИРОВАННЫХ СРЕД”

Фергана, 24-май, 2024 год.

guarantee, based on a semiconductor strain gauge with resistance R, it is necessary to measure a signal that is one-fifth of the allowable tolerance for the transducer class when investigating the stability of the strain gauge resistance over time [3].

Contemporary semiconductor technology enables the production of stress transducers with extremely thin film.

This presents extensive opportunities for investigating the stress condition in components of construction frameworks composed of concrete, polymers, and other substances, enabling the identification of optimal designs for intricate building structures and the efficient utilization of building materials. These sensors can be utilized to analyze the principles of stress distribution in many forms of intricate stress states within building structures, dams, and foundations.

Solid-state stress transducers eliminate the need for intricate amplifying equipment and facilitate the automation of the measurement procedure. The user's text is [4].

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THE MANIFESTATION OF DIMENSIONAL EFFECTS IN THIN COATINGS

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Annotation. The purpose of this article is to investigate the unique characteristics of thin films in comparison to bulk materials, with a particular emphasis on the dimensional effects that influence the behavior of thin films. Surface area, near-surface atoms, and surface tension are all discussed in relation to their influence on physicochemical qualities respectively. Furthermore, it sheds information on phenomena such as decreased melting temperatures and increased strength in thin films, providing insights into the synthesis of these films as well as prospective applications for them.

Key words: Thin films, dimensional effects, substructural effects, surface area, near-surface atoms, uncompensated bonds, surface tension, physical phenomena, quantum effects, melting point, disordered structure, metastable phases, nonequilibrium deposition, chemical equilibrium, polycrystalline films, grain size, crystallite size, and material synthesis are some of the topics that are discussed in this article.

Research conducted in the field of thin films has uncovered a fundamental distinction between the state of a thin film and the state of a bulk (also known as a "massive") state. This distinction resides in the presence of dimensional and substructural effects. These parameters have a substantial impact on the grain sizes (crystals), particles, phase components, pores, and different flaws that are present within the crystalline structure. As a result, the physicochemical properties of the material are impacted. The following are the primary characteristics that are considered to be indicative of the appearance of dimensional effects in thin coatings:

1.It is important to note that the relevance of the interface between the material (thin film) and the environment dramatically increases as the size of the structural components diminishes. When it comes to solids, periodicity can be observed in three dimensions through the arrangement of atoms in crystals structure. The appearance of a surface, such as thin films, causes this periodicity to be disrupted and causes the characteristics to undergo the most basic changes. As an illustration of this quality, take into consideration a cube that has edges that are one meter in length (see Figure 1).

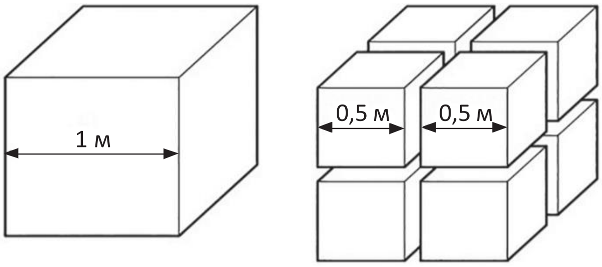

Figure 1. Illustrates how the size of the thing affects the role that the surface plays in the object.

This object has a total surface area of 6 square meters, which is calculated by multiplying the height and width of the cube by the number of faces for the cube. In the event that you divide this cube into eight equal pieces, each of those sections will be a cube with an edge that is two times smaller than the original one, measuring 0.5 meters, and an area of 1.5 meters, while the overall surface area will be 12 meters squared. The total surface area of a large cube is significantly different from that of a small cube, despite the fact that the volume of a large cube and the total volume of small cubes are identical.

2. The percentage of atoms that are located close to the surface of the structure increases dramatically when the size of the structural components decreases. As the size of the coating diminishes, a greater fraction of the atoms will end up at the boundaries or on the free surfaces. For this reason, the ratio of the surface area of the material (S) to its volume (V) is proportional to the amount of atoms that are located at the surface (A). The characteristic size of the object in issue is denoted by the letter R. Here is what happens:

$$A = \frac{S}{V} = \frac{R^2}{R^3}$$

Because of this, the proportion of atoms that are close to the surface of a thin material increases as the thickness of the layer that it is composed of decreases.

3. As the size of the structural components diminishes, the proportion of atoms that are not compensated near the surface increases. Near-surface atoms, in contrast to those that are found in the volume of a solid, do not involve all of the bonds that are formed with surrounding atoms (see Figure 2 for further information). As a

consequence of this, the near-surface layer experiences significant aberrations of the crystal lattice, which might result in a change in the nature of the crystal formed.

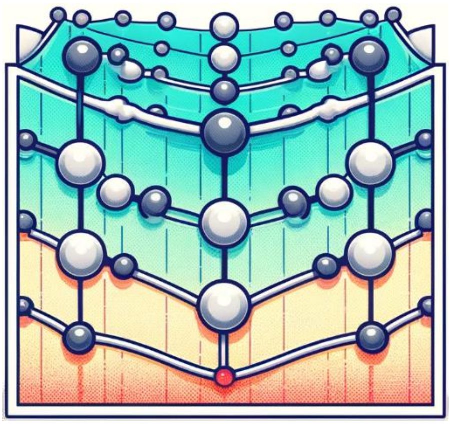

Figure 2. Uncompensated bonds of near-surface atoms in a thin film

4. It is observed that the influence of surface tension increases in proportion to the reduction in size of the structural components. Due to the fact that surface tension forces operate in the near-surface layer, their effect is comparable to that of applying external pressure. This means that they have the ability to change parameters such as the melting point, the freezing point, the chemical reaction equilibrium, and the interplanar distances when they are applied.

5. There is a possibility that the size of the structural components in thin coatings will eventually reach a point where it is comparable to the size of certain physical occurrences. This will occur when the size of the structural components starts to shrink. It is possible, for instance, for the thickness of metal films to become comparable to or even less than the free path of carriers in transport phenomena. This would result in a discernible change in the conductivity of the material. In this particular instance, the scattering of carriers on the surface of the film has a substantial impact, and as a consequence, the film's effective conductivity is reduced.

6. Dimensional effects in thin films can have a quantum aspect when the size of the crystallite becomes comparable with the de Broyle wavelength. Consider the impact that the dimensional effect has on the physical and mechanical

characteristics of a thin-layer sample as an illustration of the differences between the qualities of a "massive" sample and those of a thin-layer sample.

A drop in the melting point of thin film materials has been observed over a considerable period of time in comparison to huge samples. This is due to an increase in the amplitude of atomic vibrations in the near-surface layers, which has been observed to be the basis for this phenomenon. For example, the melting point of compact silver drops to 1110 K during the transition from crystallites with a size of 100 nm to crystallites with a temperature of 1233 K. This temperature change occurs during the transition. The melting point drops to 593 degrees Kelvin as a result of further reduction in grain size to 20 nanometers, which is an even bigger decrease. The freezing point of water droplets with a radius of 2 nanometers drops to 234 Kelvin, which is a decrease of 39 degrees Celsius. This is an interesting fact.

When compared to the strength of well-annealed bulk samples, the strength of certain films can be nearly 200 times higher. Furthermore, the strength of materials that have been subjected to cold treatment is normally on the higher end of the spectrum.

Two variables are responsible for this extraordinary strength that has been exhibited. For starters, when compared to materials that have been subjected to cold treatment, polycrystalline films display a structure that is more disordered and is characterized by smaller crystallite sizes. In the second place, when films are sufficiently thin, dislocations inside them become hindered at surfaces, and as a result, they contribute very little to plastic flow. This occurs because dislocations traverse the whole thickness of the film.

In the form of thin films, it is possible to create a wide variety of various alloys and compounds that have an atypical composition. The production of metastable phases and compositions that display great stability at room temperature and elevated temperatures is the consequence of the deposition of thin-film layers under conditions that are not in equilibrium. This capability is the outcome of the formation of metastable phases and compositions. On the other hand, the presence of different phases and compositions in bulk materials is often controlled by chemical equilibrium, which includes factors such as solubility considerations.

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BI_2B_3VI VA $SB_2B_3^{VI}(B^{VI}$-SE, TE) QOTISHMALARINING XUSUSIYATLARI VA TERMOELEKTRIK SAMARADORLIKLARINI NAZARIY TAHLILLARI

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Abstract. This article conducted a full study of the base's thermo electric power coefficient, precise thermal conductivity, temperature range and magnetic fields. This study was conducted when various levels of donor and recipient were added to Bi_2Sb_3 alloys.